66,291-140 (ABB Ref: 8027)
09/194,567

PATENT

REMARKS

I. INTRODUCTION

Applicants hereby respectfully request reexamination and reconsideration of the application in light of the foregoing amendments and arguments to appear hereinafter.

II. REJECTION OF CLAIMS 1, 10 AND 19 UNDER 35 U.S.C. § 112

Claims 1, 10 and 19 stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which is not described in the specification. Particularly, the Office contends that there is no support in the specification that the windings, as claimed, include a flexible conductor. Applicants respectfully submit that this rejection has been overcome by appropriate amendment to the specification. No new matter has been entered inasmuch as "flexible" was disclosed in the originally presented claims, the amendment to the specification merely conforming the specification to the claims, as permitted. Accordingly, Applicants respectfully request that the rejection of claims 1, 10 and 19 be reconsidered and withdrawn.

III. REJECTION OF CLAIMS 5 AND 9 UNDER 35 U.S.C. § 112

Claims 5 and 9 stand rejected under 35 U.S.C. § 112, second paragraph. The Office contends that reference to "the securing device" in claim 5 is confusing, lacking proper antecedent basis. Applicants respectfully submit that proper antecedent basis does exist. Claim 3, on which claim 5 depends, provides the appropriate antecedent basis necessary to overcome this rejection. Claim 3 recites the securing device by stating "a contact area between two layers and a *securing device*, mutually securing the two layers. . . ." (emphasis added). As recited in claim 3, the "positioning means comprises a resilient layer . . . and a securing device."

With respect to the rejection of claim 9, the Office contends that reference to the "positioning means" lacks proper antecedent basis. Applicants respectfully submit that this rejection has been overcome by appropriate amendment to claim 9. Applicants respectfully

submit that the foregoing amendment to the claim constitutes only one of form, and does not constitute, nor is intended to constitute, a narrowing amendment.

Accordingly, Applicants respectfully request that the rejection of claims 5 and 9 be reconsidered and withdrawn.

IV. <u>REJECTION OF CLAIMS 1,2 AND 6-9 UNDER 35 U.S.C. § 103</u>

Claims 1,2 and 6-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shildneck (U.S. Patent No. 3,014,139) in view of Elton et al. (U.S. Patent No. 4,853,565). The Office contends that it would have been obvious to have used the cable as taught by Elton et al. as winding conductors to the stator as disclosed by Shildneck, since such a modification according to Elton et al. would provide a cable that prohibits the development of corona discharge and equalizes the electrical charge generated between two layers. With respect to claim 2, the Office further directs Applicants' attention to Fig. 5 of Elton et al., whereby the Office contends that Elton et al. teach using insulated blocks, ties and axial brackets to secure and provide support for the windings. Applicants respectfully traverse this rejection for at least the following reasons.

<u>NO MOTIVATION TO COMBINE</u>

To establish a *prima facie* case of obviousness, a suggestion or motivation to combine or modify must be present at every stage in the Office's sequence of logic, additionally, there must also be a reasonable expectation of success. Applicants respectfully submit that the Office has placed undue emphasis on the mere availability of various elements of the claimed invention without giving proper weight to the difficulties and/or disincentives in making the various modifications/combinations to arrive at the <u>invention as a whole</u> (as claimed). Applicants respectfully submit that no motivation, incentive or suggestion exists to combine Shildneck and Elton et al..

Shildneck is an electric machine that possesses windings formed of cable. However, the machine of Shildneck is a high current/low voltage machine, and Applicants respectfully

submit that unlike the present invention, Shildneck would not work in a high voltage application. Shildneck's objective is to solve issues with high current/low voltage designs.

Shildneck describes a low-voltage, high-current machine with unconventional windings. As shown in Figs. 1-4, the outermost layer of the winding in Shildneck (*i.e.*, element 8 in Figures 1-4) is made of an insulation material, as opposed to the semiconducting layer of the present invention. One object of Shildneck is to reduce the thickness required in the ground insulation (by providing a round conductor). If operated at high voltages, corona would develop in an ionized discharge path between the insulation material and the stator. The electric discharge from the insulation material to the stator would result in a deterioration of the insulation material, and would ultimately lead to a breakdown of the machine.

In machines operating at higher voltages, the coil end is normally provided with an electric field control, or so-called corona protection varnish intended to convert a radial electric field into an axial field, which means that the insulation on the coil ends occurs at a high potential relative to ground. The electric field control evens out the dielectric stress of the insulating material in the end winding region, but electric field concentrations are still a severe problem in electrical machines operating at these higher voltages.

Shildneck has no electric field control to speak of, and such is not needed for machines, like those of Shildneck, which operate at such low voltages. Conventional insulation of conductors in electrical machines (such as so called mica-tape) is produced, to some extent, to provide resistance to partial discharge. If the ground insulation material, as used by Shildneck (silicone rubber), were subjected to partial discharge, it would eventually lead to deterioration of the insulation material. Also, if Shildneck were operated at higher voltages, the uncontrolled electric field in the end winding region would also result in high electric field concentrations causing a high dielectric stress of the insulation material, leading to deterioration of the insulation material and failure.

The "invention" in Elton et al. is the pyrolyzed glass fiber layer. Elton et al. describes a process of immersing the winding portions in a bath of resin and vacuum pressure impregnating (VPI) the resin in the winding. The VPI process results in a cured resin having

no voids or gaps between layers. The cable 100 shown in Fig. 7 of Elton et al. includes two pyrolyzed glass fiber layers, layers 104 and 110.

> The internal grading layer 104 is a semi-conducting pyrolyzed glass fiber layer as disclosed herein. . . . An insulation 106 surrounds internal grading layer 104. On the external surface of insulation 106, a semi-conducting pyrolyzed glass fiber layer 110 equalizes the electrical potential thereon.

Applicants submit that cable 100 would not be suitable as a winding in an electric machine. Cable 100 has two pyrolyzed glass fiber layers that would cause the cable to be prohibitively stiff and not suitable for winding through the stator slots. It may be possible to VPI the entire stator in a large resin bath after it had been wound with a flexible cable, however, such a process would not be feasible to produce both the internal grading layer 104 and the external layer 110 since an insulation layer 106 surrounds the internal grading layer 104 and both layers 110 and 104 would need to be exposed to the resin. Accordingly, while Elton ('565) describes how to provide a pyrolyzed glass fiber layer for a bar-type winding, it does not teach or suggest that cable 100 could be used for such a purpose, especially since the cable 100 would be stiff, not flexible.

Elton et al. recognizes that in the end-winding region just outside of the stator of an electric machine, there will be problems caused by strong electric fields. As a solution, Elton et al. describes using a known grading near the stator to allow some of the accumulated charge to bleed off to the stator, thus reducing the risk of arcing, but it offers no other solutions to the problems in the end-winding region. The strong electric fields will be present throughout the end-winding region, not just near the stator. The grading used in Elton et al. will help to lessen the effects of the strong electric fields near the stator, but will not address the problems in the end-winding region away from the stator, further evidence that Elton is describing a conventional bar-type winding. Elton et al. uses rigid bar-type windings which are able to withstand mechanical stresses caused by induced fields between the windings in the end-winding region, where electromagnetic fields are not contained in the

winding. The mechanical rigidity of the bar-type windings suppress the amount of vibration in the end-winding region that would otherwise be present. The fact that a grading system is used to lessen the end-winding region problems near the stator in Elton et al. is further evidence that it does not suggest using cable 100 as a winding of a machine, since such a cable would not have a grading.

Moreover, Applicants contend Elton et al. teach mutually exclusive embodiments (*i.e.*, a "cable," a "bar," or "windings" in a generator). When the appropriate teaching from Elton et al. is considered, one of ordinary skill would not see an incentive to combine it with Shildneck. Elton et al. disclose, generally, the semiconducting layer for insulated electrical conductors in three different embodiments, none of which are a cable winding. The first embodiment (Figs. 1-6) deals with windings in a dynamoelectric machine. In this embodiment, the conductors are referred to exclusively as "windings" or "bars." The second embodiment (Fig. 7) relates strictly to an electrical cable 100 used for the transmission of high voltage. Within this embodiment, the conductor is referred to as a "cable" and not as a "bar" or "winding." The third embodiment (Fig. 8) relates to the use of a semiconductor layer disposed on an electrical housing surrounding digital electrical equipment. The conductor in this particular embodiment is referred to as a "housing" as opposed to a "cable", a "bar," or a "winding." In reviewing the Elton et al. reference, the terms used were carefully chosen and applied uniformly throughout the reference.

The present invention specifically embodies a flexible cable winding and cable structure. The cable allows for a continuous full turn, making a joint in the end winding unnecessary. This, along with the fact that the outer surface of the cable is grounded, allows for the confinement of the electric field resulting in the diminished risks of losses and damage in the end winding region. Elton et al. may teach a cable, however, in no way does it teach the cable as a winding.

Moreover, there is no likelihood of success. The MPEP § 706.02(j) sets forth the burden that the Office must carry in order to reject claims based on obviousness. One criteria

that must be met is that there must be a reasonable expectation of success. This criteria cannot be met when the aforementioned references are combined.

Assuming for the sake of argument that the cable 100 recited in Elton et al. is combined with the cable windings of Shildneck, there is no likelihood of success because of the inflexibility and brittleness of cable 100. The pyrolyzed glass layer of cable 100 would crack when attempted to be wound around a core. These cracks could facilitate corona discharge as opposed to prohibit it, as is contended by the Office, resulting in losses attributed to the lack of confinement of the electric field, rendering the system inefficient. It is, therefore, not surprising that Elton et al. makes no disclosure of the use of cable 100 as a "winding" in a dynamoelectric machine.

Accordingly, for at least the reasons set forth above, Applicants respectfully request that the rejection of claims 1, 2 and 6-9 be reconsidered and withdrawn. Applicants further submit, as an alternate ground of allowability for claims 2 and 6-9, that these claims depend on base claim 1 (believed allowable), and therefore, include every limitation thereof. Accordingly, Applicants respectfully request that the rejection of the dependent claims be reconsidered and withdrawn in view of the believed allowability of base claim 1.

V. REJECTION OF CLAIMS 3-5 AND 10-19 UNDER 35 U.S.C. § 103

Claims 3-5 and 10-19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable Over Shildneck (U.S. Patent No. 3,014,139) in view of Elton et al. (U.S. Patent No. 4,853,565) and further in view of Cooper et al. (U.S. Patent No. 4,618,795). The Office contends that it would have been obvious to have provided means for securing the winding layers as well as cushion between the layers of the coils as taught by Cooper et al., to the electrical machine of Shildneck and Elton et al. since such a modification would provide support, reduced stress and wear between the stator coil end turns. Applicants respectfully traverse this rejection for at least the following reasons.

First, claims 2-5 depend from base claim 1 (believed allowable), and therefore, include every limitation thereof. Inasmuch as base claim 1 is believed to be allowable,

dependent claims 2-5 are also believed to be allowable for at least the same reasons pertaining to base claim 1.

Second, there is no motivation, incentive or suggestion to combine the Shildneck and Elton et al. references as set forth in Section IV above. Because the base combination is improper, any broader combination is likewise improper, therefore, the broader combination of the Cooper et al. reference is improper.

However, even were such a combination proper (which it is not), not all of the limitations of the present invention are met by the combined references. Claim 10, for example, positively recites, in-part, "end windings form layers *crossing each other and coming into contact* and positioning means for securing portions of the cable in the layers in fixed positions in order to prevent fretting contact. . . ." (emphasis added). None of the cited references disclose, teach, or suggest this limitation. Cooper et al. disclose end windings that are spaced apart, not coming into contact as is claimed in the present invention. This limitation is instrumental in achieving one of the stated objects of the present invention, which is to make the "machine more compact, even though it comprises several layers of windings." (Applicants' Specification, p. 5, lines 28-30). Further, none of the references teach the "positioning means" as is claimed in the present invention. Positioning means permits a selected permissible amount of non-sliding relative movement between the cables. Cooper et al., on the other hand, performs the different function of uniting the two stator winding ends for movement <u>together</u>, relative to the stator, not <u>relative</u> movement between end windings themselves. In this vein, the Office's attention is directed to column 4, lines 8-12 of Cooper et al.:

> The result is a physically <u>united</u> assembly of coils 14a and 14b With brace top piece 40 that is free to move axially due to thermal effects and with the brace bottom piece 40 to end bracket 22 keeping radial movement to a minimum. (emphasis added).

For at least the reasons set forth above, Applicants respectfully assert that independent claims 10 and 19 define novel and non-obvious subject matter. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Additionally, claims 11-18 depend from base claim 10 (believed allowable), and therefore, include all of the limitations thereof. Accordingly, for at least the same reasons regarding the allowability of claim 10, dependent claims 11-18 lend themselves to patentability, and are likewise believed to be allowable. Accordingly, reconsideration and withdrawal of the rejection is hereby respectfully requested.

VI. CONCLUSION

The foregoing represents a genuine effort to address and resolve all remaining issues. For the foregoing reasons, all presently pending claims are now believed to be in condition for allowance. Early notice of the same is hereby respectfully requested.

Respectfully submitted,

Date: June 22, 2001

By: ____________________

John W. Rees, Reg. No. 38,278
Dykema Gossett PLLC
39577 Woodward Avenue, Suite 300
Bloomfield Hills, MI 48304-5086
(248) 203-0832
jrees@dykema.com

John P. DeLuca, Reg. No. 25,505
Dykema Gossett PLLC
Franklin Square, Third Floor West
1300 I Street N.W.
Washington, DC 20005-3535
(202) 522-8626
jdeluca@dykema.com

::ODMA\PCDOCS\BH01\299717\2

66,291-140 (ABB Ref: 8027)
09/194,567

PATENT

EXHIBIT A

MARKED UP COPY OF AMENDED CLAIMS

9. (Amended) A rotating electric machine according to claim [1] 3, wherein the positioning means comprises at least one of a conductor and an insulator.

66,291-140 (ABB Ref: 8027)
09/194,567

PATENT

EXHIBIT B

MARKED UP COPY OF AMENDED SPECIFICATION

Page 4, lines 34-38, continuing on Page 5, lines 5-30:

By using flexible high-voltage insulated electric conductors, in the stator winding, with permanent insulation, which comprises an inner layer, surrounding the conductor, with semiconducting properties and that the insulation is also provided with at least one additional outer semiconducting layer, surrounding the insulation, with semiconducting properties. The inner semiconducting layer shall function in such a way as to even the potential by connecting it to a selected potential and on the other part by enclosing the electric field around the conductors within the outer layer. Semiconducting properties in this context is a material which has a considerably lower conductivity than an electric conductor but which does not have such a low conductivity that it is an insulator. For example, the inner and outer semiconducting layers may have a resistivity within the interval 10-6 Wcm – 100 kWcm. By using only insulating layers which may be manufactured with a minimum of defects and, in addition, providing the insulation with an inner and outer semiconducting layer, it can be ensured that the thermal and electric loads are reduced. [t]The voltage of the machine can be increased to such levels that it can be connected directly to the power network without an intermediate transformer. The step-up transformer is thus eliminated. Another advantage is that the design of the insulation system will make it possible to arrange the layers of the windings more freely. At the end windings it is possible to let the layers cross each other and to mix layers of windings with different voltage. This makes it possible to make the machine more compact, even though it comprises several layers of windings.

Page 7, lines 13-24:

Figure 2 shows a cross section of a flexible cable 4 used in the present invention. The cable 4 comprises a conductor 6 with circular cross section, consisting of a number of strands and made of copper, for instance. This conductor 6 is arranged in the middle of the cable 4. Around the conductor 6 is a first semi-conducting layer 7. Around the first semi-conducting layer 7 is an insulating layer 8 of XLPE insulation, for instance. Around the insulation layer 8 is a second semi-conducting layer 9. In this context a cable does not include the outer protective sheath which normally surrounds a cable for power transmission or distribution.